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I also certify that the attached copy of the request for grant of a Patent (Form 1/77) bears a correction, effected by this office, following a request by the applicant and agreed to by the Comptroller-General.

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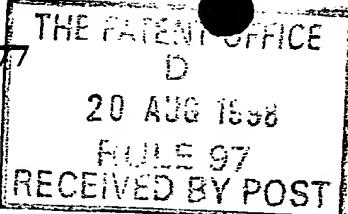
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20 AUG 1998

21AUG98 E384808-2 D02846  
Dat/7308195.44 - 02846.4**Request for grant of a patent**

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

**9818186.0**

The Patent Office

Cardiff Road  
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Gwent NP9 1RH**1. Your reference**

PLB/CC/N876

**2. Patent application number**

(The Patent Office will fill in this part)

X 1/1 3/2/99

**3. Full name, address and postcode of the or of each applicant (underline all surnames)**

07594257001

UNDERSHAW GLOBAL LIMITED  
TRIDENT CHAMBERS  
PO BOX 146  
WICKHAMS CAY  
ROAD TOWN  
TORTOLA  
BRITISH VIRGIN ISLANDS  
BRITISH VIRGIN ISLANDS

Comedco Technology  
Development Limited  
The Fold, 3 City Lane  
HALIFAX  
HX3 3HE

**4. Title of the invention**IMPROVEMENTS IN AND RELATING TO  
DATA COMMUNICATION**5. Name of your agent (if you have one)**

APPLEYARD LEES

"Address for service" in the United Kingdom  
to which all correspondence should be sent  
(including the postcode)

15 CLARE ROAD  
HALIFAX  
WEST YORKSHIRE  
HX1 2HY

Patents ADP number (if you know it)

AA005 190001

**6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number**

Country

Priority application number  
(if you know it)Date of filing  
(day / month / year)**7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application**

Number of earlier application

Date of filing  
(day / month / year)**8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:**

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
- c) any named applicant is a corporate body.

See note (d)

YES

Patents Form 1/77

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Continuation sheets of this form

Description 8 x 2

Claim(s)

Abstract

Drawing(s) 2 x 2

20

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents  
(please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

Appleyard Lees

Date

19 AUGUST 1998

12. Name and daytime telephone number of person to contact in the United Kingdom

PAUL BRANDON  
0161 228 0903

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IMPROVEMENTS IN AND RELATING TO DATA COMMUNICATION

Field of the Invention

5 The present invention relates to data communication devices and methods.

Background to the Invention

10 With the growth of computer networks, including the internet, local area networks, wide area networks and intranets, additional problems have been created in relation to computer security. In particular, the possibilities for unauthorised remote access into a 15 computer (sometimes referred to as "hacking") have been increased.

20 Hackers seeking unauthorised access have developed various forms of software to assist in these attacks, including those that make multiple attempts to gain access through password controlled systems. Typically such software will try various permutations of possible 25 passwords until the correct one is found. For this reason, amongst others, many systems require passwords of a minimum length, but as these have to be memorised by a user only a certain minimum length is practicable. Thus, many password lengths fall in the range of 4-8 characters. This makes a software-assisted attack on the system a real risk to any password protected function or data.

30

It is an aim of preferred embodiments of the present invention to obviate or overcome at least one disadvantage encountered in relation to the prior art, whether referred to herein or otherwise.

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Summary of the Invention

According to the present invention in a first aspect, there is provided a data communication system comprising 5 an input device for generating a plurality of input signals available from a set of input signals and a character generator configured to receive an input signal and generate an output signal comprising a plurality of signals from the set of input signals in which the output 10 signal is different from the signal input to the character generator.

Suitably, the output signal is of a different length to the signal input to the character generator. More 15 suitably, the output signal is longer than the signal input to the character generator.

Suitably, the system further comprises means for comparing the output signal with a stored password. More 20 suitably, the comparison means further comprises means for outputting a signal dependent upon the correspondence of the output signal with the stored password.

Suitably, the input device comprises a keyboard. 25  
Suitably, the set of available input signals comprises all or part of the character set of the keyboard.

Suitably, the system comprises a first input and a second input in which the character generator receives signals from the first input and does not receive signals 30 from the second input.

Suitably, the first input is a local input device such as a keyboard or microphone and the second input is a remote based input device typically providing signals via a modem connection.

5

Suitably, the input signal comprises or corresponds to one of the set input signals.

10 Suitably, the set of input signals comprises alphanumeric characters.

15 According to the present invention in a second aspect, there is provided a digital computer comprising a data communication system according to the first aspect of the invention.

20 According to the present invention in a third aspect, there is provided a data communication method comprising receiving an input signal available from a set out input signals, generating an output signal comprising a plurality of signals from the set of available input signals, in which the output signal is different from the input signal.

25 Suitably, the method further comprises the step of repeating the operation for a plurality of input signals.

Suitably, the output signals vary in length one from the other.

30

Suitably, the method according to the third aspect of the invention is modified according to the first aspect of the invention.

35

Brief Description of the Drawings

5 The present invention will now be described, by way of example only, with reference to the drawings that follow; in which:

10 Figure 1 is a schematic functional illustration of an embodiment of the present invention.

15 Figure 2 is a functional flow diagram illustrating operation of a preferred embodiment of the present invention.

Description of the Preferred Embodiments

15 Referring to Figure 1 of the drawings that follow, there is shown an electronic digital computer (2), typically a personal computer ("PC") comprising a keyboard (4) connected via a data line (6) to a processor (8).  
20 Those skilled in the art will appreciate that various elements intervene between the keyboard and processor.

25 On the data line (6) between keyboard (4) and processor (8) is a character generating device (10).

Other input ports (12, 14) as also shown which may be from, for instance a modem.

30 The character generating device (10) is configured to selectively modify the output of keystrokes from keyboard (4) to produce additional output for password verification, until that password verification is achieved and then revert to normal keyboard output operation.

The operation of the device will now be described in more detail with reference to Figure 2 of the drawings that follow.

5 From a mode (200) in which the PC (2) is operating normally, as access is requested either to functions or data, the PC checks (202) to determine whether the function or data is password protected. If not, the "NO" branch is followed and normal operation resumes with  
10 access permitted. If the function or data is password protected, the "YES" branch is followed and a suitable password is requested (204) and the character generating device is configured (206) to output additional characters according to a predetermined scheme.

15 Then, as each keystroke of the password is input (208) the signal is received by the device (10) and a corresponding longer output is generated (210). Thus, by way of example, if the keystroke "F" is entered, the  
20 device may output "P7TTWR0". The actual output is substantially immaterial so long as it is in accordance with a predetermined relationship between the input key and output sequence from the device (10).

25 The system then determines if the password input is finished (212). This may be by detecting the input of a < ENTER > key, the length of input or some other characteristic. If the input is not finished, the system requires a further input keystroke. If the input is  
30 finished, the "YES" branch is followed and the input password is compared with a password in memory (214). If the password is correct, the "YES" branch is followed, the character generator is deconfigured (216) so input passes normally access to the function or data is permitted and

normal operation resumed. If the password is incorrect, the "NO" branch is followed and access is denied (218).

5 Instead of access being denied on the first entry of an incorrect password, several attempts can be permitted, but normally not an unlimited number.

10 In addition to access being defined upon entry of incorrect password, additional alarm functions may be actuated.

15 The original password may also be input using this method and device. The user need never know or be concerned with the longer version of their password.

Accordingly, using the present invention it is possible for a user to remember a relatively short password, say "FRED" but for the processor to require validation of a much longer password which may or may not 20 include the original password elements. By way of example, keyboard keystrokes of "FRED" at the password request stage may generate:

	F	-	P7TTWR0
25	R	-	X3NR?B
	E	-	2ARV88CI9
	D	-	CCAB

30 So, a password input keystroke of four characters generates a twenty-six character long password for verification.

35 The device and system is configured so that remote access to the PC (2) is not via the device (10) so that such remote access requires entry of the full (longer)

password required by the processor. Accordingly, protection from external hacking is enhanced.

5 The present invention can be embodied in hardware and/or software. Typically, in a hardware embodiment the device is located in a keyboard.

10 The "passwords" referred to herein may be of any signal or combination of signals and need not be "words" at all.

15 The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

20 All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

25 Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

35 The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any

novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any 5 method or process so disclosed.

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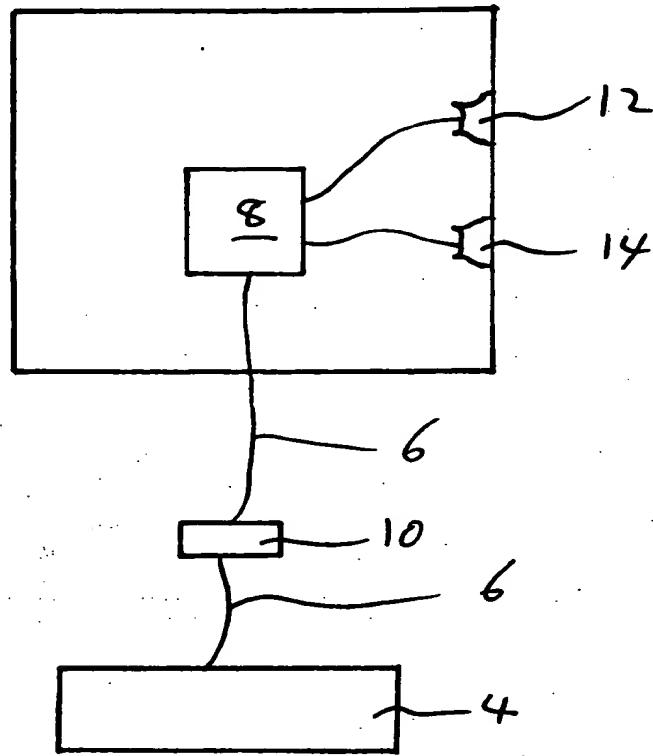


Figure 1

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212

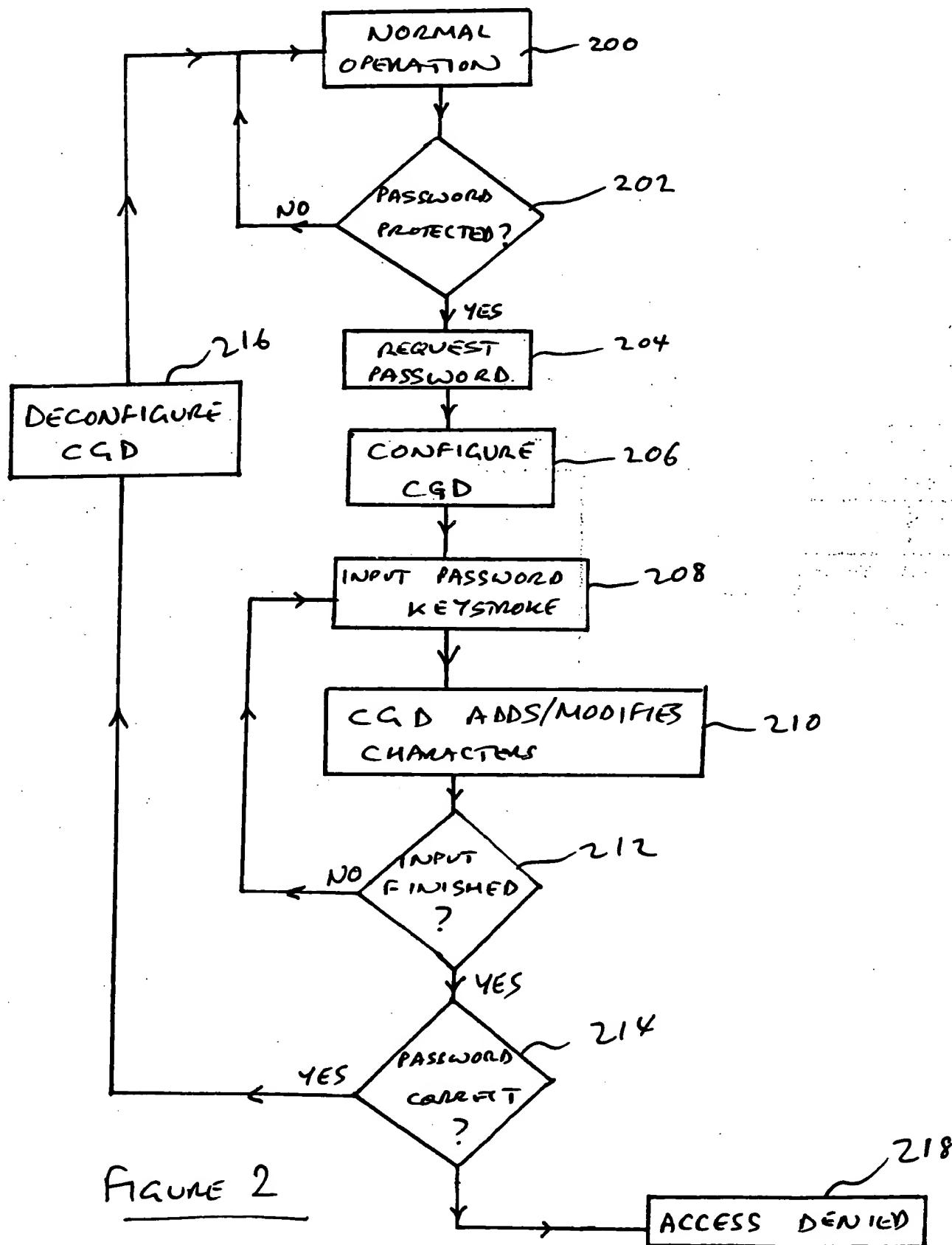


FIGURE 2

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